EARTHQUAKES

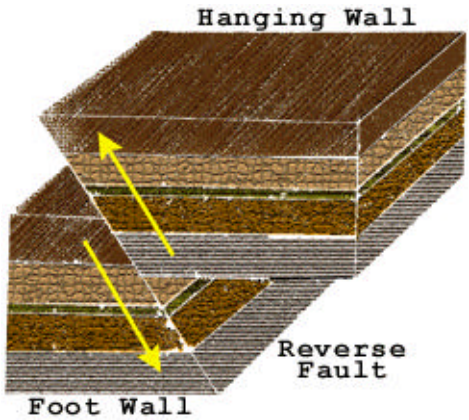
objective: 3240-0501

The solid crust that we stand on seems very strong and stable. The plates we live on are constantly in motion. Normally we don't feel this motion, but every once in a while the earth reminds us how dynamic it actually is. An earthquake is the vibrations we feel when the earth's crust suddenly moves. What causes these sudden, larger movements of the crust? You have probably played with a rubber band, even shooting it at your brother or sister. When you stretch the rubber band, you know that it will normally snap back. If you pull it too far, it will break. The earth's crust act much in the same way. The plates can stretch so far, but if they stretch farther than their elastic limit, they will break and release huge vibrations that can be felt large distances away.

The crust moves along cracks called faults. A fault is a break in the earth's crust. The earth can move in different directions depending on the type of fault.

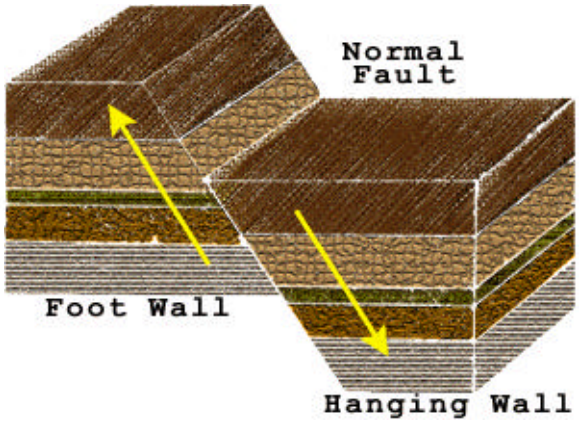
TYPES OF FAULTS

REVERSE

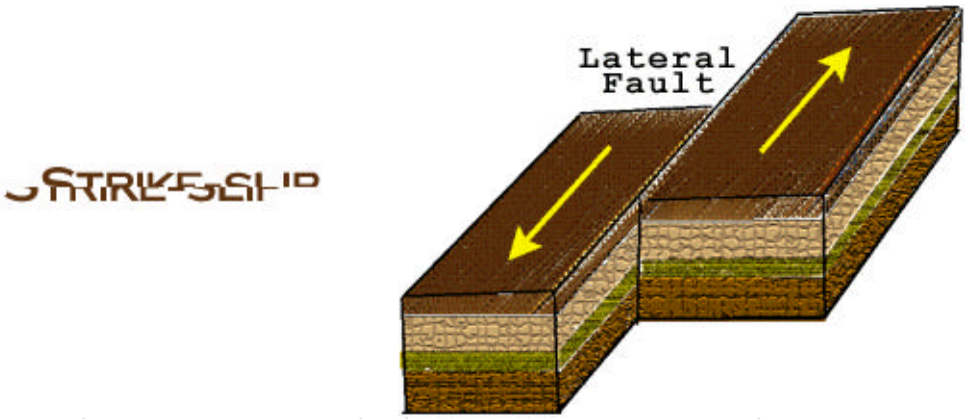


When the earth's plates come together, they produce compression fores that push on rocks from either side. Sometimes the rocks bend. Other times they break and one rock slides up over the other. In a reverse fault the rock above the fault slides up and over the rock below the fault.

NORMAL



Tension, a pulling force that causes the plates to move apart, can create a normal fault. The rocks above a normal fault move downward as the plates below the fault move upward.



At a strike-slip fault, the rocks on either side of the fault slide past each other. This sliding force is called shearing. As the plates slide past each other, the forces bend and twist the land. Sometimes the land gets caught as it slides. When it releases or breaks, an earthquake occurs.

The Three Types Of Stresses On The Earth's Crust

Types	Description	Boundary Type
Compression	pushing together	Convergent
Tension	pulling apart	Divergent
Shearing	sliding past	Transform

Associated formations:

Compression: anticline, sincline, reverse fault, thrust fault, folded mountains, volcanos, Island arc, trenches.

Tension: normal faults, fault block mountains, rift valley, midocean ridge, volcanos.

Shearing: lateral faults

The activity Candy Quakes is a fun method to illustrate the above types of stresses.

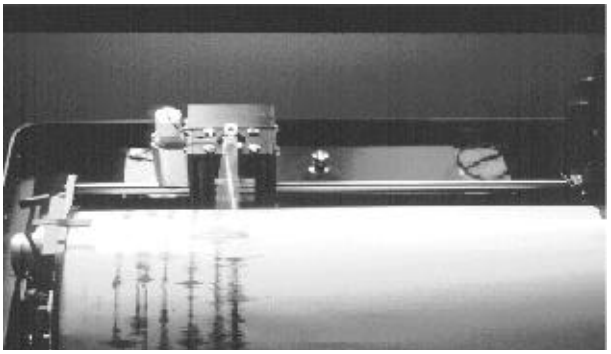
MEASURING AN EARTHQUAKE
We have all seen waves on the ocean, but we don't think of land as being able to move in waves. However, when energy is released from a fault, it travels outward through the land in waves. The point beneath the earth's surface where the actual breaking occurs is caled the focus. The waves travel outward from the focus in all directions-just like when you drop a pebble in water. The point on the earth's surface directly above the focus is called the epicenter.

PRIMARY (P) WAVES The waves that travel the fastest are called primary or P waves. If you were to push down on a spring, it would contract and then stretch. P waves move in this push-pull motion. They can travel through solids, liquids, and gases. As the P wave travels through the rock, it stretches and compresses the rock particles. A quicktime video demonstrating this wave motion will open in a new window. Close the window to return to this page when you finish.

SECONDARY (S) WAVES If you and a friend have ever held a jump rope between you, you probably moved the rope up and down like a whip. A secondary, or S wave moves through the earth causing the rock particles to move at right angles to the direction of the wave. Secondary waves can move through solids, but not liquids or gases. A quicktime video demonstrating this wave motion will open in a new window. Close the window to return to this page when you finish.

SURFACE (L) WAVES Surface, or L waves, are the slowest moving waves. L waves generate outward from the epicenter on the surface of the earth. Surface waves move like waves in the ocean, causing the surface of the earth to move up and down in an eliptical motion. L waves cause the most damage because surface structures aren't made to bend and twist. A quicktime video demonstrating this wave motion will open in a new window. Close the window to return to this page when you finish.

TAKING MEASUREMENTS



A **seismograph** is an instrument that detects primary, secondary and surface waves. A seismologist is a scientist who studies seismic waves and earthquakes. A seismograph consists of a weight attached to a wire or a spring like a pendulum. The weight is stationary because it isn't connected directly to the earth. A marking instrument is attached to the weight and records on a sheet of paper when the earth moves. What do you think the line looks like when the earth is still? When it is moving? Seismologist use a scale created by Charles Richter and Beno

Guttenberg in 1935 called the Richter scale. It measure the height of the tallest wave on the seismograph and calculates the magnitude or strength of the earthquake.

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